

## Towards a Taxonomy of Forest Goods and Services

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**Abstract** In light of the increasing realisation of the importance of all forest resources, the dichotomisation of forest resources into timber and non-timber is proving to be overly simplistic. Furthermore, at present there is no satisfactory operational definition for non-wood forest products and considering the tremendous variety of forest products it may be doubted that such a definition is possible. This paper examines this inadequacy and its consequences for a productive, holistic approach to the analysis of forest resources and their management. In an attempt to address these problems, a system for dealing with forest resources in a more meaningful, holistic manner is proposed. A clear distinction is made between systems of terms for classification, and terms used for comparison, of forest products. Classifying terms distinguish between classes or groups of objects with similar characteristics while comparative terms serve to highlight differences. Definitions are best served by classifying terms and this paper proposes both logical targets for definitions of forest products and a pragmatic typology for such products.

**Keywords** NWFP terms · NTFP classification · Forest product typology · NTFP definition

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## Introduction

Before the 1980s, forest policy and formal management focused on the use of forests as factories for timber production and downplayed other products such as mushrooms or conservation. This resulted in a dichotomisation of forest products into 'timber' as the primary product and 'everything else' as secondary products. Since then there has been an increasing realisation that many other products and services generated by forests are essential to the well-being of local communities, required by society at large that must be accommodated by forest management. The fact that many of these non-timber products do not require the cutting of trees and provide subsistence and incomes for local people also means that they (i.e. the products and associated uses) provide a useful tool for achieving conservation objectives which has further perpetuated distinction between timber production and conservation. Nevertheless, the broadening of forest management objectives is now widely accepted, although the historical prejudices between timber and other products continue. This paper examines the definition and purpose of terms that perpetuate these false dichotomies.

Topics discussed in this paper are the origin, use and problems with existing definitions of Non Timber Forest Products (NTFPs) using the FAO definition of Non Wood Forest Products (NWFP) as an example. Then in a more general way criteria for proper scientific definitions are introduced and the difference between classifying and comparative terms discussed in relation to forest products. Based on current usage and the anticipated further development of holistic forest landscape management, a unified classification of forest goods and services is proposed.

## The FAO Definition of Non-wood Forest Products

The FAO (2005) defined non-wood forest products as 'products of biological origin other than wood, derived from forests, other wooded land and trees outside forests. NWFP may be gathered from the wild, or produced in forest plantations, agro-forestry schemes and from trees outside forests'. Although this is a seemingly straightforward definition there has been a proliferation of practically interchangeable terms attempting to describe disparate forest products. Examples of such terms are: 'other', 'minor', 'non-timber', 'secondary' and 'special' forest products, as well as terms dealing explicitly with services, giving rise to the expressions 'non-wood goods and benefits' and 'non-wood goods and services'. Each of these terms reflects the perspective and intention of the authors or organisations proposing the definition with the defining characteristic of all referring to *forest* products and therefore having currency within *forestry*, but not across other related disciplines such as agriculture, conservation or wildlife management. Despite subtle differences, all of these terms are commonly understood to refer to products such as mushrooms, fruit, leaves, plants and animals collected or grown in forests and used as food, fodder, medicine, as raw materials for handicrafts and with significance as cultural objects and as a source of income and subsistence. This leads to the rather anomalous

situation of a large and generally recognisable group of products for which there are no clear terminology.

Taking the FAO working definition as a starting point there are three components of the term ‘non-wood forest products’ which are interpreted as follows:

1. *Non-wood*: This is intended to exclude all woody raw materials. Consequently, timber, chips, charcoal and fuelwood, as well as small pieces of wood used in tools, household equipment and wooden carvings and other wooden products are excluded. Non-timber forest products (NTFPs) by contrast generally include fuelwood and small-wood; this is the main difference between these terms.
2. *Forest*: NWFPs are derived from forests and similar land uses. FAO elaborated the definitions of ‘forest’ and ‘other wooded land’ in a working paper for the Forest Resources Assessment of 2005 (FAO 2004). Since plantations are included in the FAO definition of forest, non-wood products obtained from plantations, such as Maple syrup (the concentrated sap of *Acer saccharum* and *A. nigrum*) and Scottish venison (deer meat, for example that of *Cervus elaphus*), are included in the definition of NWFPs. Many NWFPs are derived from both natural forests and forest plantations. ‘Trees outside forests’ is a relatively new term and was introduced in much the same manner as NWFP, to draw attention to previously overlooked resources of interest to foresters (Loupe and Pain-Orcet 2002).
3. *Products*: In FAO’s definition, the term ‘product’ corresponds to goods that are tangible, physical objects of biological origin, including plants, animals and their by-products. Forest services (e.g. ecotourism, bioprospecting) and forest benefits (e.g. soil conservation, watershed protection and maintenance of biodiversity) are excluded. Intangible services are even more difficult to assess and quantify than goods and have therefore been excluded from most publications dealing with NWFPs. A clear definition of forest services is still lacking.

## Discussion of the FAO Definition

Terms arise not only from a strictly scientific perspective but are shaped by their context and more often than not evolve as a pragmatic response to policy or advocacy needs. It is these forces which have dominated in the definition of the term NWFP as exemplified by its history within FAO.

The term NWFP is rooted in tropical forestry of the late 1980s. As extensive forest clearance for agriculture collided with a forestry ethos emphasising the production of raw materials for the wood industry, environmental, economic and social problems were exacerbated. In response, viable economic and social alternatives to timber production were sought. Consequently, numerous other potential and existing products were identified. The attribute common to these resources was that harvesting them did not necessarily involve felling trees. Within FAO the recognition of the social and livelihood significance of these resources was

precipitated by the work by Falconer (1990) who juxtaposed the term ‘major significance’ against the then commonly used term ‘minor forest products’ to emphasise that they were given insufficient attention. Having accepted that these products are important, FAO had to find somewhere to place them within the institution. Interdepartmental issues meant that they were placed in the Forest Products Division (FOP) and it is here that the term NWFP evolved to identify the new branch from the traditional business of the FOP, which of course, was timber with the addition of fuelwood in the early 1980s. The concept of these resources being outside the focus of previous forest management resulted in the use of the prefix ‘non-’. The term NWFP was officially adopted by FAO in 1995 (Chandrasekharan 1995).<sup>1</sup> Within FAO it is clear that NWFP is used as the ‘everything else’ term and institutional arrangements also explain the omission of services from the NWFP program as this was already the mandate of other units. However convenient, such institutional considerations make little sense when considered from other viewpoints such as ecosystems or landscapes, and particularly those of local communities who often view the forest from a holistic perspective.

The use of the ‘non’ element in a term (as in NWFP and NTFP) signifies a comparative term because it defines the resources of interest by opposition or comparison with other products rather than directly describing what they are. The terms NWFP and NTFP have now become so deeply established that it is often considered futile to even consider alternatives (Belcher 2003). This is nevertheless necessary because their continued use results in incongruities and conflicts with the original goals of their authors.

Definitions themselves are not true or false. They are only adequate or inadequate in relation to the goal or purpose the definition is to serve. Therefore, it is important to first clarify these goals. Unfortunately, there is no clear statement of the purpose of the NWFP term by which to judge its adequacy, but there are useful clues in the mission of the FAO NWFP programme which is designed to ‘improve the sustainable utilisation of NWFP in order to contribute to the wise management of the world’s forests, to conserve their biodiversity, and to improve income-generation and food security’ (FAO 2007).

These and other problems occur because the purpose of the term NWFP was not clearly defined before the term was coined. Fuelwood and small-diameter wood are important income sources in many countries. Mushrooms for example grow both in the forests and on agricultural land. Are mushrooms picked in the forest a NWFP, but not mushrooms picked on agricultural land? What about mushrooms picked in a forest meadow? And how are trade statistics to differentiate between the origins of the mushrooms? It is not meaningful to exclude these resources from further consideration simply because they are difficult to classify. An alternative term, used by many foresters is Non-Timber Forest Products (NTFPs), and this term includes fuelwood and small-diameter wood. However, most studies pertaining to NTFPs

<sup>1</sup> However, note that the FAO Community Forestry Unit used the term NTFP until it was disbanded in 2000 presumably because this better suited its approach to forest management.

make no mention of fuelwood so this is not really functionally included. Nevertheless, taking the term at face value may solve some problems such as the omission of wood-carving activities, but would also create other systematic problems. For example, fuelwood is becoming a more important resource in many countries, not only for households, but also large industry. Is fuelwood burned in large electricity generation plants a NTFP or does this only include fuelwood burnt by households? The exclusion of services from NTFP is also inconsistent because many material (i.e. physical) products cannot be sold without some service. The whole concept of NWFP/NTFP is politically useful but not adequate or fruitful for analyses or marketing. These terms are counterproductive. Picture a salesperson attempting to sell a Harley Davidson motorcycle with the name 'Non-Four-Wheel-Driving-Machine' and who because he does not like the complex 'word salad', announces it as a NFWDM. Imagine how successful they are likely to be!

There is no reason why these resources should continue to be defined by a system that is both structurally unsound and negative. These resources merit being classified in positive terms based on their properties and the markets for which they are produced. Tradition is the only apparent reason for the continued use of the terms NWFP/NTFP. Is it still meaningful to differentiate between wood and non-wood forest resources? The main purpose for devising these terms was to facilitate communication by grouping similar objects so generalisations could be made in a meaningful and productive manner—in this case we wish to make generalisations concerning marketing opportunities. A Christmas tree is definitely a wood product in that it includes the wooden stem of the tree. However, what is marketed at the point of sale is not only the tree, but also a service combining various seasonal, festive resources which include a disparate collection of products such as mistletoe branches and venison goulash. Is the Christmas tree to be excluded while the mistletoe branches and venison goulash are classed as NWFPs? That seems illogical and serves no useful purpose. The product in many of these cases is not simply the meat or tree but also the cultural association with Christmas and it is this synergy that underpins opportunities to profit from festive products.

Future environmental and social demands will certainly redefine the role of wood production. These shifts in emphasis and the realisation of the increasing importance of resources other than those based on timber, demand management plans promoting the development of sustainable use of the forest which are able to embrace changes in demand and use of forest products. The concept NWFP does not and cannot address this potential adequately. The negative connotations of non-wood must be replaced by a system that more fully addresses the potential for positive change and growth attributed to these resources. However, in order to develop a new system for classifying forest products the scientific criteria for adequate definitions must first be taken into consideration.

Jones (2004) notes that 'the term NTFP is not based on a biological or ecological category but rather is a political economic category useful for highlighting overlooked values and biodiversity that can occur when timber production is the primary focus of forest management'. This sentiment was echoed by Barry (2005) who noted that 'all of the terms are meant to underscore the fact that forest-based economies are more complex than the simple harvesting of trees'. This emphasis on

stimulating appreciation of under-valued forest-based livelihoods is the one unifying feature of all NTFP activities and as such the term continues to serve a useful purpose. This is evidenced by the proliferation of formal institutions that have adopted the term, including for example NTFP Scotland, Nepal NTFP Alliance Network, Centre for Non-timber Resources (Royal Roads University), Global NTFP Partnership (Global Forum for Agricultural Research) and Non-timber Forest Products Exchange Programme (South and South-east Asia). Generally within the forestry sector, as pointed out by Belcher (2003), the term NTFP has been widely adopted in Asia (notably India and Nepal), the USA and Canada and has some currency in Europe. As such, the term is likely to remain in use at least in the near future. It is nevertheless still constructive to consider a more holistic term and a meaningful typology of forest products.

In conclusion, perhaps it is time to work towards banishing all ‘non-terms’ from forestry to create scientific clarity and remove all negative connotations from forest resources, giving them all equal attractiveness and presenting them as a broad variety of attractive goods and services.

## Criteria for Scientific Definitions

FAO (2004) pointed out that definitions are the cornerstone of any information and knowledge system and observed that even minor variation in their formulation will increase the likelihood of outcomes that diverge from those intended. It is therefore important to base a typology on sound definitions. Carnap (1956) defined four criteria to test the adequacy of a definition:

*Similarity*: A term must be similar to the phenomenon that it symbolises.

*Exactness*: A term must exactly include the phenomenon it denotes. Often a single word does not suffice to explain a phenomenon. In such cases a system of terms can be used to fulfil this criteria.

*Fertility*: A term must be fruitful in terms of theories and conclusions that can be derived from or with it.

*Simplicity*: A term must be ‘simple’ as a definition, and simplify the construction of conclusions and theories.

Terms can appear in three forms:

- (1) Classifying terms: These divide phenomena in various classes (e.g. plants, animals).
- (2) Comparatives terms: These terms facilitate comparisons (e.g. rivalry and excludability; material and immaterial)
- (3) Quantitative or metric terms: These are used for the classification of qualities by numerical values (e.g.  $m^3$ , kg, dollars, index numbers)

The term NWFP is a classifying term, but does the term fit on the criteria for proper scientific definition?

The similarity between the term and the resources most often associated with it is imperfect. This is because common use of the term tends to include all types of services and is most often restricted to plants. Services and animals are definitely 'non-wood' resources. If the term is meant to describe only plant and animal products, why is it not defined as Forest Plant, Fungi and Animal Products (FPAP)? This is more similar to the phenomenon. In this respect, the term NWFP is used as an imperfect common denominator (something which a disparate group of items have in common) rather than as a classifying term. Further accretions on this rather imperfect definition such as the addition of '&S' for services (NWFP&S) have increased confusion because services could already be included in NWFP. Imagine if this continues for future specifications. The definition can only become more exact, by making it more complicated. Even experts have problems understanding what is included and what is not.

A term that combines various alternatives to traditional use of timber in the wood industry remains an empty term rendering it infertile in increasing understanding or for theory-building purposes. As a consequence, theories built on the NTFP concept are inadequate on one hand and too broad to generate specific knowledge for special product areas on the other.

Lastly the purpose of the term must be clarified. If the objective is increasing income possibilities for forest landowners or other persons utilising forest resources, then the 'non'-term is counterproductive because it has negative connotations and is unspecific. It is simultaneously inexact and too complicated for scientific progress.

## Classification Schemes for Non-Wood Forest Products

Despite incongruities in the semantics of their definitions, at least for now, the terms NWFP and NTFP, serve a useful purpose within the forestry sector. Obviously the terms include a great many products and there have been several attempts to classify them for various purposes. Wong (2000) identified five basic approaches to the classification of NTFPs, as shown in Table 1. Each classification has been derived more or less in isolation, for specific purposes by interest groups with little interaction (in particular foresters, range managers and conservationists that arise from different disciplines and traditions). Product type classifications such as the Harmonized Commodity Description and Coding System<sup>2</sup> are universal and include codes applicable to NWFPs in international trade. However, as pointed out by Chandrasekharan (1995), there are many deficiencies in these codes because they do not distinguish many forest-derived products which end up grouped with agricultural products or products from non-forest habitats. Other attempts at a universal classification of ecosystem services (e.g. de Groot et al. 2002) have not been widely adopted and do not permit easy distinction of the disparate group of entities included within the term NWFPs.

<sup>2</sup> United Nations Statistics Division, Harmonized Commodity Description and Coding System, (HS 1996).

## A Unified System of Classifying Terms for Forest Products

Users of the term NWFP are aware that it is less than ideal, but contend that there is no better alternative that can be used as a collective noun for non-wood products. However, this distinction may not be necessary—mushrooms, rattan and bushmeat are as much products of the forest as trees, wood and timber, and mainstream forestry must embrace them all. As shown in Table 1, there are several ways that forest products can be classified, all having merit for different purposes. A unified system therefore must strive to accommodate these different perspectives in a way that facilitates understanding of the complex interactions of products, uses, biological entities and cultural values.

Terms assist in classifying phenomenon and should help to communicate purpose. The following goals are normally linked with studies of forest resource potential:

- (1) Provision of income opportunities for rural areas;
- (2) Diversification of incomes for forest owners; and
- (3) Recognition of the value of all forest resources.

The ultimate objective is to devise a typology which will encompass all forest resources including wood. This is because it is important to consider all production possibilities of a forest in order to determine the best choice between production goals and develop comprehensive management systems. In addition to economics, other aspects lead to the integration of wood into any new system. Wood in the context of energy shortages and CO<sub>2</sub> sequestration is an increasingly significant resource and environmental issue. Furthermore, the concept of sustainability is so broadly accepted that the contrast between wood production and forest conservation

**Table 1** Common classification schemes for NTFPs

Classification factor	Used for	By	Examples
Product type	International reporting of trade statistics	Customs and Excise, FAO	Chandrasekharan (1995)
End use	Valuation and bioprospecting	Ethnobotanists	Prance et al. (1987) Boom (1989) van Valkenburg (1997) Salick et al. (1995) Malhotra et al. (1991)
Plant form and part	Strategic in-forest resource inventory	Foresters Resource managers	Kleinn et al. (1996) Wong (1998) Cunningham (2001)
Family and overall size	Hunting quotas	Wildlife managers	FitzGibbon et al. (1995) Lahm (1993)
Management characteristics	Management planning	Resource managers	Wiersum (1999)

is no longer a theoretical problem although political understanding and action are still lacking. Finally, all goods and services derived from forests have their foundations in trees, regardless of whether their utilisation requires the harvesting of trees or not. A typology for forest products that excludes elements of its own basis is not convincing.

The variety of forest products is so diverse that one term cannot cover all aspects. Thus a new open system of terms for forest-dependent resources is proposed: *Forest Goods and Services* which are here defined as *resources of biological origin, associated with forests, other wooded land and trees outside forests* with the acronym FOGS.

Definitions of forests, woodlands and trees outside forests are not provided in this paper. Hundreds of definitions of forests and woodlands are available in the professional literature. Lund (2002) found 179 societal definitions, 27 international definitions and 349 legal definitions, for a total of 555 definitions of the word 'forest' alone. It is likely that a search for woodlands and 'trees outside forests' would produce similar results. Therefore, any definition of these terms presented in this paper would be unsatisfactory to some readers. It is left to the reader to use those definitions that best pertain to the society, country or international group within which they work. However, since it was decided to use *forests, woodlands and trees outside forests* as the working definition, every possibility has been covered and specific definitions of forests or wooded land and trees are not necessary.

A new feature of the proposed definition of FOGS the term *forest associated*, which is here defined as *those resources utilised for the production of goods and services that are either biologically dependent upon forests, or those for which the imagery of forests is an integral facet of their marketing*. An important aspect of this definition is that it includes species that are not entirely restricted to forest habitats even though forest environments are necessary for some aspect of their existence. For example, while deer often range outside forests to browse, they are none-the-less dependent on forests for shelter. This definition also includes products for which the imagery of forests is integral to their marketing. These are typically goods traditionally harvested from forest ecosystems. While not all of these resources are strictly biologically bound to forest ecosystems, cognitively they remain tied to the forest. An example of such a product is berries that can be cultivated outside forest environments, but are still thought of and marketed as 'fruits of the forest'. Likewise services such as various recreational pursuits (e.g. orienteering) can be performed outside the forest environment but their association with forests is a major aspect of their desirability and provides a decisive market advantage for these products. Considering the vast differences in cognitive and therefore marketing strategies from one culture to the next, it is fruitless to expect forest-associated categories to remain constant on a pan-European or global basis. Mountain biking is for example closely associated with forests in the British Isles while in Iceland it is associated with treeless landscapes. The important point is to permit the logical and flexible inclusion of goods and services to facilitate activities and inquiries concerning forest resources in a meaningful manner.

Before proceeding with the elaboration of the proposed typology it is first necessary to define some underlying terms:

- A *resource* in the context of forest is anything of biological origin of use to humans that may be drawn upon when needed.
- An *output* is anything made from a resource (and can be a good or service).
- A *good* is any separate entity made from a resource capable of being stored and delivered to an end user.
- A *product* is anything that can be offered to a market that might satisfy a want or need. A product can be a simple good (e.g. fuelwood) or a complicated mixture of goods and services (e.g. Christmas tree market).
- *Services* are heterogeneous outputs typically consisting of changes in condition of the user provided by the producer and are produced and consumed simultaneously.
- A *user* is any person or group of persons deriving a forest-associated benefit (as a good or service) or fulfilling any need for forest resources with or without payment.
- A *client* is a user who pays for a product or a service.

The proposed typology is tripartite in nature i.e. based on three basic levels: resource, product and user. Each of these levels may be internally classified into as many hierarchical levels as required to describe the forest transaction (use) of interest or as required to facilitate analyses or marketing.

### Resources Level

A *resource* is the basis for any output. Resources for *goods* are energy, carbon, land, water, materials, plants, foodstuff,<sup>3</sup> fibre, medicine, extractives and live plants or animals.

Each category can be further subdivided, e.g. foodstuff can be subdivided into roots, fruits, leaves and seeds; fibre can be subdivided into that derived from wood, bamboo or animal hair.

Resources for *services* are personal, recreation, social and environmental.

Again each category can be subdivided e.g. recreation can be divided into motor sports, photography, camping and hiking.

### Products Level

A *product* is a marketable good or service or combination of both.

<sup>3</sup> Products of the forest which are used as food by humans, this is a subset of what is edible in the forest as it is culturally conditioned and several items used as foodstuff are hardly conventionally *edible* (e.g. cinnamon is the ground bark of a tree used as a flavouring which is indigestible while nutmeg is poisonous in large quantities).

Products in the form of goods are made from resources, e.g. seeds can be made into a confectionary product.

Products comprised of services such as ‘bicycling’ can be subdivided according to the type of facility provided such as specialist downhill trails, single-track or forest road.

Composite products which comprise goods and services packaged together are commodities such as Christmas tree markets, guided mushroom-picking walks.

### Users Level

*Users* are any group of people who benefit from a product. This includes collectors, processors, middlemen, retailers and the end-user or client. This level therefore describes the market or value-chain for a given product. For example, foliage may be collected by a farmer, sold to a wholesaler who sells to a wreath manufacturer who sells on to a retailer from whom people attending funerals can buy a wreath.

Where should species be placed in this typology? For a forest product, especially those collected from the wild, the recognition of species is a critical issue. Often, a product can be made from several species, e.g. jam can be made from several different species of berry and this is important in marketing—in this case since the distinction is significant for marketing, the subdivision of the product ‘jam’ by species ‘blackberry’, ‘raspberry’ etc. may be most relevant as a sub-level of products. Alternatively if species can be freely substituted in a product (any wood will do) then it may be best to distinguish species as a sub-level under resources as this distinction is most relevant to resource managers. If the species is itself the item of interest (e.g. summer truffles) then the classification of resources, products and users can be defined species by species, requiring a complete matrix for each. Likewise, geographical regions or other categories that might be of interest can be incorporated as needed. However, *resource*, *product* and *user* remain the core categories of the taxonomy. Each resource can be made into several products and products are handled and consumed by many different user groups. Table 2 lists a few examples of the range of resource, product and users relating to specific transactions for both goods and services to illustrate the impossibility of devising a simple taxonomy capable of encompassing these complexities. The proposed tripartite typology, along with classificatory sub-divisions within each part, is illustrated for goods and services in Table 3. However, this separation into goods and services is for illustrative purposes rather than an implied division in the typology and as shown below there is a lot of interaction between goods and services. Indeed as shown in Table 3 the higher level classification levels for both goods and services are very much the same.

Harking back to the simple transactions illustrated in Table 2, Table 4 illustrates the way in which the typology would deal with a single transaction. In the case illustrated pertaining to Brazil nuts collected by a co-operative which peels and bags them, the wholesaler sells the bags to a road-side vendor who then sells them to a lady purchasing a snack to eat on the bus.

**Table 2** Overview of examples of individual forest product transactions

Resource	Product	User
<i>(a) Goods</i>		
Material	Stemwood	Sawmills
Energy	Fuelwood	Households
Fibre	Baskets	Wholesaler
Carbon	Equity funds	Investors
Land	Building plots	Households
Water	Bottled water	Wholesaler
Air	Afforested land	Communities
Plants	Erosion control	State
Foodstuff	Nuts	Confectionary manufacturer
Medicine	Herbs	Pharmaceutical industry
Extractives	Dyestuff	Textile industry
Live plants	Bonsai	Bonsai retailers
Live seeds	Trees	Tree nursery
<i>(b) Services</i>		
Personal	Well-being	Tourists
Personal	Training	Forestry workers
Recreation	Extreme mountain biking	Youth
Recreation	Camp grounds	Families
Social	Healthy exercise	People with heart conditions
Social	Culture	Community arts group
Environmental	Infiltration capacity	Floodplain properties
Environmental	Biodiversity	Plants

The real world is much more complicated than any system of terms can cover and combinations of products are often bundled together as a matter of convenience. This gives rise to unlimited possible combinations as indicated in Table 4, but this is a problem inherent in almost any statistic. Several methods for dealing with this type of situation exist. For example, the NACE<sup>4</sup>-system used to classify enterprises into economic sectors assigns an enterprise to the sector with the highest net production. A sawmill, for example, that produces staircases will be classed as a sawmill and not a carpentry operation as long as the net product of the sawmill operations is higher than 50% of the net product of the combined enterprise. For a product-based system, the costs of production rather than the volume or value of net production may be the most relevant criteria for the assignment of an enterprise to a sector. Generally the labour cost for carving is higher than the value of the log. In this case the carving would be classed as a material aesthetic product while if the converse was true the product would be classed as a log and for statistical reasons the additional value created by carving would be added to logs. But within the FOGS-classification-system a special group for carved logs may be included, if

<sup>4</sup> NACE: *Nomenclature générale des Activités économiques dans les Communautés Européennes*.

**Table 3** Systemisation of goods and services within the proposed tripartite forest products taxonomy

Level	1	2	3	4
(a) Classification of resources				
<i>Resources—goods</i>				
Description	Classes of biological resources removed from the forest, dependant on trees or associated with forests	Subdivision of the main categories according to gross morphological types	Species from which the specified part is removed	Location from which the species is harvested in this manner
Example	Extractives	Sap	<i>Acer saccharum</i> <i>Acer rubrum</i>	New England
Level	1	2	3	4
<i>Resources—services</i>				
Description	Services offered in forest	Category of service	Type of service	Specification
Example		Recreation	Cycling	Mountain biking
				Cycle touring
				Family cycling
				Hiking
			Walking	Forest roads
				Waymarked trails
Level	1	2	3	4
(b) Classification of products				
<i>Products—goods</i>				
Description	General class of product	Subdivisions to permit the identification of major types of product	Type of process used to create the product	
Example	Foodstuff	Syrup	Tapping	

**Table 3** continued

Level	1	2	3
<i>Products—services</i>			
Description	Category of product	Type of product	Output
Example benefits derived from use of forest services	Personal	Health	Cardio-vascular fitness
			Mental health
		Well-being	Happiness
	Social	Health	Reduced hospital expenditure
		Community	Shared experience
Level	1	2	3
<i>(c) Classification of users</i>			
<i>Users—goods</i>			
Description	Role the user plays in the value chain	Subdivision of roles	Type of user
Examples	Producer	Tree farmers	Co-operative
	Collector	Part-time tapper	Individual
	Retailer	Road-side stall	Farmer
	Consumer	Restaurant	Bistro
Level	1	2	3
<i>Users—services</i>			
Description	Role the user plays in value-chain	Category of user	Type of user
Example related to recreational use of forest	Consumer	Recreational forest visitors	Mountain bikers
	Facilitator	Land manager	Hikers
	Producer	Infrastructure	Public liaison
			Construction
Level	1	2	3
<i>Self-organised user groups</i>			
			Downhillers = young men (14–25), highly skilled riders
			Ramblers association
			Forest ranger
			Volunteers from local mountain bike club

**Table 4** Example of the forest products taxonomy for a specific product

Goods		
Resource	Products	Users
<b>Foodstuff</b>	Process	Producer
Plants	Raw	Farmer
Trees	<b>Peeled</b>	<b>Co-operative</b>
Seeds	Roasted	Company
<b>Nuts</b>	Salted	Distributor
Almond	Dried	Wholesaler
<b>Brazil nut</b>	Presentation	<b>Retailer</b>
Chestnut	Canned	Consumer
Coconut	<b>Bagged</b>	<b>Personal</b>
Pine nut	Loose	Household
Pistachio		Restaurant

required for a specific purpose. In such a case, the product would be linked on the users' level as a material aesthetic product.

One advantage of the proposed classification is that it highlights the fact that forest product transactions involve the transformation of resources into products which have to be successful in markets which are directed at the end user. Including all of these elements facilitates the examination and description of the value chains which are increasingly being developed as a basis for interventions to promote the successful commercialisation of NWFPs (Marshall et al. 2006).

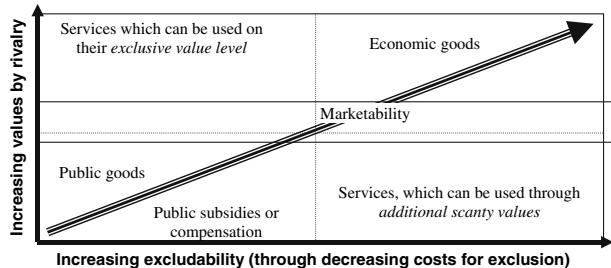
Keying out the proposed FOGS typology would be problematic using simple dichotomous keys and the classification proposed here is best developed as a polyclave (or synoptic) key that permits multiple entry points. Polyclave keys are probably most familiar to plant taxonomists and are used to identify plants using different characters (distinct features of a plant which can vary such as leaf shape which are used in classification) as starting points or in combination, e.g. flower colour and leaf shape. In the case of forest products the starting point could be either resource, product or user or a combination of them that serves to identify and thus describe the product of interest. In the above mentioned example of a carving with a high log value, the economic value would be classed under resources (wood, log), the product under services (personal, aesthetic, carving) and the marketing strategy under the users group for buyers of material aesthetic values.

### Systems of Comparative Terms of Forest Products

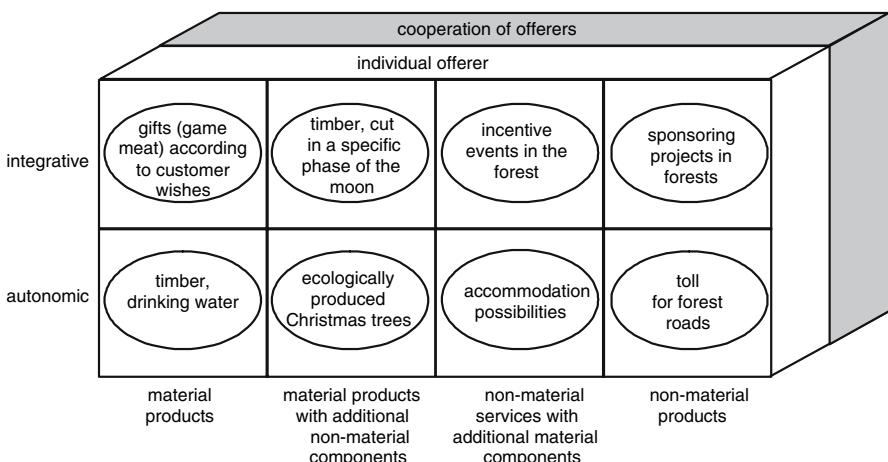
Comparative terms allow the observation of differences (e.g. rivalry and excludability). They are helpful in understanding product development processes, marketing strategies, economic structure and other aspects of product transformation and transfers. For example, the continuous transition from a public to a private good can be shown by a matrix of degrees of rivalry and exclusion costs (Mantau

1994). The figure can be divided into four fields from which many implications for marketing strategy can be drawn. The matrix utilises performance characteristics, possibility of market exclusion or rivalry as criteria to define classes of particular product types, and points out that these performance characteristics will change over time and as a result of marketing strategy. This model is presented in a simplified form as Fig. 1.

From a marketing point of view the relationship between the client and the production process is highly important. Integrated products are highly influenced by clients (sponsoring), while autonomous products are offered completely by the producer (canned nuts) without any influence on the production process by the user. The conceptual relationship by Welcker and Mertens (2001) which illustrates these concepts is shown in Fig. 2. The product segmentation resulting from these product and demand features provide complex opportunities for comparative description. Marketing strategies and contractual solutions are similar within the segments.



**Fig. 1** Continuous structure of goods and strategy fields for public goods. *Source:* Modified from Mantau et al. 2001 (p 6)



**Fig. 2** Typology of products being offered in a market-place. *Source:* Welcker and Mertens (2001)

The dimension ‘cooperation of offerers’ is included in Fig. 2 because the costs of offering a specific product in the marketplace are different for single enterprises and co-operative groups of enterprises. Co-operative marketing will carry an internal organisation cost, that causes transaction costs to be higher than for a single enterprise, but may be the only way to offer the product, e.g. on small forest ownerships.

The two comparative terms described are examples for setting up comparative terms to serve in analysis or marketing. Depending on the analysis, an unlimited number of comparative terms can be developed. The more assistance they provide in policy analysis or marketing of goods and service, the higher their value.

## Conclusions

Although the problem of defining a term to distinguish NWFPs from timber products remains, this paper points to the more fundamental question of whether such a distinction is the most efficient way to classify the myriad of goods and services provided by forests. Not only does the division into timber and ‘non-timber’ minimise the importance of those goods and services pre-fixed ‘non’, it also hinders the management of these resources in a holistic manner. Forest ecology, resources and economics are complex, interrelated disciplines. Any system attempting to divide these aspects and deal with them in an individual manner will ultimately prove inadequate. The tripartite typology ‘RPU’ (resource, product, user) presented in this paper demonstrates a holistic approach that, unlike current practice, provides a higher degree of flexibility for dealing with forest resources. This typology does not attempt to define or confine these complexities to tightly defined categories, but rather provides a tool that can be used to address problems at multiple levels with various degrees of complexity. This is done in light of the realisation that increasing demands for FOGS (Forest Goods and Services) and changing environmental and economic factors can only be met by using a holistic approach that recognises the value of all forest resources. So instead of perpetuating the distinction between wood or timber and anything else from the forest what we propose is to set up a set of classifying terms for FOGS which can be used to place any product or service in relation to the resources, products and users of the forest RPU—hence the FOGS-RPU system. The next step would be to test the usefulness of the proposed RPU typology in a real-world situation and ideally one which involved resource valuation as this is the primary perspective of the FOGS classification system.

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